Management issues to be addressed by the North American marsh bird monitoring program

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Abstract

The program to survey marsh birds in North America will help identify species at risk, set harvest rates, design and evaluate management programs, and document progress towards population goals. The program will help us understand the species' habitat and other environmental relationships and will provide a measure of whether society is living in a manner that is sustainable for the long-term. The program will also help managers address many local issues of concern. Experience with other long-term programs indicates that the program will help us address many other issues that are difficult to foresee at present. Perusing the bibliography of publications based largely or entirely on the Breeding Bird Survey (available at http://www.pwrc.usgs.gov/bbs/results/) is a good way to appreciate the range of management issues that can be addressed using data collected in long-term, multiple-species, abundance-monitoring programs such as the proposed survey for North American marsh birds.

Introduction

In April, 1999, a workshop was held at the Patuxent Wildlife Research Center to discuss creation of a marsh bird monitoring program for North America. The target species for the program, as described by Ribic et al. (1999) in the Workshop Proceedings, were

> *Primary species:* pied-billed grebe; least and American bitterns; sora; clapper, king, Virginia, black and yellow rails; American coot; purple gallinule; and common snipe
>
> *Secondary species:* herons, cranes, Franklin's gull, black and Forester's terns, belted kingfisher, sedge and marsh wrens, willow and alder flycatchers, common yellowthroat, sharp-tailed and LeConte's sparrows, and red-winged and yellow-headed blackbirds.

Those in attendance concluded that a long-term abundance monitoring program for these species would be useful in addressing many management and research issues. Since 1999, a great deal of work has been carried out to design the proposed survey, and a second workshop will be held in March, 2006, to consider whether we are ready to

implement the program. This report summarizes management issues the long-term program will help address. Other reports summarize the proposed sampling plan, field protocols, and data base design for the marsh bird monitoring program.

Much has been written about ways in which long-term, multi-species programs that monitor the abundance of birds help address management issues (Bart et al. 2004, Coordinated Bird Monitoring working Group 2004). Schmidt (2006) summarized the utility of monitoring programs as follows:

> "*Where would conservation be without monitoring programs? It's hard to imagine. They provide scientists, wildlife officials, private organization and industry leaders, and the public with essential information to make scientifically based decisions to improve bird conservation and management. They provide information to determine which species are in the greatest need of conservation and management and to establish priorities for allocation of limited resources. They also help scientists and managers evaluate bird response to habitat manipulation and regulate game bird harvest. In fact, monitoring and evaluation should be integral components of all on-the-ground projects and population management decisions. Such adaptive resource management is just good business and helps keep us accountable for the work we do*."

Hutto and Young (2002) make the important point that an over-arching goal of bird monitoring programs is to help indicate whether we are "living sustainably".

Considering how a long-term program will be useful is an important step in creating the program because different goals may have different implications for design. For example, attention may be focused on estimating long-term trends, but recognizing that investigating habitat relationships may also be useful leads us to consider whether recording habitat information might be desirable. Recognizing that managers may be able to use the program's infrastructure as they address local issues may lead us to a different database design. Recognizing that some uses of the long-term program will only emerge after it has been in operation for many years may lead us to incorporate more options and flexibility than we otherwise would.

This report discusses how the marsh bird monitoring program will help managers and researchers address applied and theoretical issues. The program will produce biological information of many kinds, and it will be useful in addressing many different management issues. I use the following categories in discussing specific ways that the program will be useful:

Biological information	Management issue
Distribution and abundance	Identifying species at risk
Long-term trends in population size	Setting harvest limits
Habitat relationships	Designing and evaluating management programs
Responses to environmental changes	Documenting progress towards population goals
	Investigating basic biology
	Helping managers address local issues

The report has one section for each management issue listed above. In each section, an effort is made to foresee which issues will be most important for marsh birds. Ways in which long-term programs have been helpful with other groups of birds are also described as an indication of the breadth of issues that will probably be addressed once the marsh bird program has been in operation for several years or a few decades. Particular use was made of a bibliography of publications based largely or entirely on data collected by the Breeding Bird Survey (BBS) which is available at http://www.pwrc.usgs.gov/bbs/results/ (click on "BBS Bibliography").

Identifying Species at Risk

Wetlands are one of the most threatened ecosystems in North America (Dahl 1990, 2000; Nicholls 2004) and many wetland species are declining or probably will decline in the future. For example, the U.S. Fish and Wildlife Service's list of "Birds of Conservation Concern" includes at least 10 species on the national list that the proposed program would help monitor: yellow rail, black rail, limpkin, little blue heron, reddish egret, sedge wren, Nelson's sharp-tailed sparrow, saltmarsh sharp-tailed sparrow, seaside sparrow, and LeConte's sparrow (U. S. Fish and Wildlife Service 2002). Several other species that the program would help monitor are on one or more Bird Conservation Region lists, for example black tern, American bittern, and white ibis. In Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) identified four species of concern that the marsh bird monitoring program would help monitor: king rail (endangered), least bittern (threatened), the *fanini* sub-species of the great blue heron (special concern) and yellow rail (special concern).

The landbird and shorebird initiatives have adopted quantitative accuracy targets for identifying species at risk: 80% power to detect a 50% decline occurring during no more than 20 years, using a two-tailed test, a level of significance of 0.10 (shorebirds) or 0.15 (landbirds) and acknowledging effects of potential bias (Brown et al. 2001, Rich et al. 2004). Bart et al. (2004) describe the rationale for this target. The waterbirds initiative has adopted a similar – though less fully specified – accuracy target: "detect greater than a 50% change over 10 years or 3 generations" (Kushlan et al. 2002).

Large-scale, long-term monitoring programs are the only rigorous method for achieving these accuracy targets. It has occasionally been suggested that "other evidence" might be suitable for identifying species at risk, however this amounts to proposing that major resource allocations, needed to recover species at risk, should be made on the basis of anecdote and conjecture, a practice that managers allocating scarce resources should not, and probably will not, follow. Failure to implement rigorous, long-term programs is thus likely to leave managers without the evidence they need to determine which species need assistance until their populations decline to the point where even the most cursory surveys reveal the declines. At this small population size, species often warrant protection under the Endangered Species Act, and recovery is difficult and extremely expensive, a point stressed by participants at the 1998 workshop (Ribic et al. 1999).

Experience with other long-term programs suggests that two kinds of studies to identify species at risk will probably be carried out. First, comprehensive reports on trends at the regional and rangewide scale will be presented and used widely by agencies, other organizations, and individuals. Long-term data and analyses made available from waterfowl surveys, the BBS, the Cornell Laboratory of Ornithology and other organizations provide models showing how this information will probably be presented and used.

Second, numerous more intensive studies, typically focused on one or a few species or issues, will be carried out using data collected in the marsh bird monitoring program. The BBS bibliography includes many publications that used BBS data to identify species at risk or describe how the degree of threat varied within or between species. For example, Droege and Sauer (1994) compared the number of declining species with the number of increasing species. Hagan (1993) studied variation in declines of the Eastern Towhee across its range. Holmes and Sherry (1988, 2001) compared local and regional trends of forest songbirds. Many other examples can be found by reviewing the BBS bibliography.

Setting harvest limits

Hunting is legal in the U. S. for several of the high-priority species for the marshbird monitoring program: sora, Virginia rail, clapper rail, king rail, common snipe, purple gallinule, common moorhen, and American coot. A similar situation exists in Canada. For most hunted species, annual population surveys provide detailed information on population trends and how they vary among regions. This information is not available for rails (including coots, moorhens, and gallinules). As a result it is difficult for regulatory agencies to make decisions on harvest or to demonstrate that the hunted species are maintaining population levels. The marsh bird monitoring program will address this information need.

Designing and Evaluating Management and Conservation Programs

Long-term monitoring programs also help managers design and evaluate management and conservation programs by revealing habitat relationships, regional differences in trend, and more complex interactions such as between species. Marshes, and the species that depend on them, face numerous problems, for example destruction due to urban encroachment, dredging, and drainage for agricultural uses and degradation due to burning, salt water intrusion, recreational use, nutria, summer drawdown, and partial drainage for mosquito control.

Experience with other long-term programs shows that data from them can be used to address many issues in program design or evaluation. For example, Robbins (1979, 1980) studied effects of forest fragmentation on birds using BBS data, and numerous investigators have carried out additional studies of this relationship using BBS data (Boulineir et al. 1998, 2001; Donovan and Flather 2002; Holmes and Sherry 2001). Several authors have studied effects on birds of agricultural practices, including the

conservation reserve program, using BBS data (Blackwell and Dolbeer 2001, Freemark and Kirk 2001, Herkert 1998, Jobin et al. 1996, Reynolds et al. 1994). The marsh bird monitoring program will doubtless support numerous investigations of this sort once it has been in operation for several years.

Documenting Progress Towards Population Goals

Just as long-term abundance monitoring programs provide the only rigorous method for identifying species at risk, they also provide the best way to document recovery. If the conservation program includes work at numerous small sites (e.g., wetlands restoration), then one question in effectiveness monitoring is whether birds respond as predicted on the treated areas. Even if positive responses occur, however, this does not prove that population recovery is occurring because the birds could simply be distributing themselves across all suitable habitat but without any change in regional or rangewide populations. Furthermore, estimating population-wide changes from the treated sites would usually be impossible even it were known that local changes were increments to population size. Thus, population wide programs are needed to fully evaluate progress towards recovery. Furthermore, when such programs have sufficient sample sizes, they provide region-specific trend estimates which enable managers to compare regions with different levels or kinds of management (e.g., population trend in relation to acreage in the conservation reserve program).

Investigating Basic Biology

As mentioned above, long-term, large-scale abundance monitoring programs provide a method for investigating environmental relationships at the regional to rangewide scale. In addition to the studies of habitat relationships described above, many authors have used BBS data to investigate other aspects of species' natural history. For example, Jones et al. (2000) studied species richness in the mid-Atlantic region of the US. Keitt and Stanley (1998) used new statistical methods to identify sub-populations and explore interactions between them. Mehlman (1997), Taper et al. (1995), and Sauer et al. (1996) studied population trends in relation to environmental changes. Wooton (1987) and Viet and Lewis (1996) studied dispersal and population growth of house finches. Peterson (2001) developed methods to predict geographic distributions based on ecological niche modeling. It can be predicted with confidence that the marsh bird monitoring program will also produce data useful for numerous investigations of the basic biology or marsh birds.

Helping managers address local issues

Managers concerned with local issues may find the sampling plan, field protocols, and analytic techniques developed for the marsh bird program helpful. They may also be able to use the continental program's database for data entry, storage, and retrieval in much the way that the BBS permits users to enter "999" routes. In the marsh bird monitoring program, however, the extra data may also be useful for the continental program. Whether this will be true depends on the final design adopted but the

recommendations by Bart (2006) involve a flexible approach in which sample sizes, and even strata and sampling unit definitions, can vary between years. This means that in many cases managers conducting a local program can define the sampling plan in their area to include both the data being collected for the continental program and the data they need. An example may clarify this point.

Consider a manager at a National Wildlife Refuge who wishes to evaluate effects of a drawdown strategy on marsh birds. Suppose that their Refuge has 10 impoundments, 2 of which will be used in the drawdown study, and that the continental program includes 4 point counts in each impoundment. Results for the continental program are computed by calculating the mean for each impoundment and combining the means using impoundment size as the weighting factor. Also assume that the managers wish to survey additional points as part of their drawdown evaluation and that these points are randomly selected from the 2 impoundments in their study. They could use the database for the continental program for data entry, storage, and retrieval. These data could also be used in the continental program. During the years of the drawdown study, the mean for the two impoundments in the drawdown study would be based on a larger sample but no other details of the analysis would change. The only requirement is that the impoundments be recognized as strata in the sampling plan.

The reason that this flexibility will probably be present in the continental marsh bird monitoring plan is that the distribution of marsh habitat varies, in many parts of the country, substantially between, and even within, years. Areas that are suitable one year may be completely unsuitable the next year. Furthermore, the marsh bird sampling plan must be habitat-based. Thus, habitats must be mapped and a capability must exist to alter these maps frequently. Taken together, these constraints mean that the sampling plan and database will be flexible enough to accommodate modifications of the sampling plan. This flexibility should also be sufficient to accommodate many local projects.

Literature Cited

Bart, J. 2006. A sampling plan for the North American marsh bird monitoring program. Unpublished manuscript available at http://greatbasin.nbii.gov/CBM_documents.htm

Bart, J., K.P. Burnham, E.A. Dunn, C.M. Frances and C.J. Ralph. 2004. Goals and strategies for estimating trends in landbird abundance. Journal of Wildlife Management 68:611-626.

Blackwell, B.F. and R.A. Dolbeer. 2001. Decline of the Red-winged Blackbird population in Ohio correlated to changes on agriculture (1965-1996). Journal of Wildlife Management 65:661-667.

Boulinier, T., J.D. Nichols, J.E. Hines, J.R. Sauer, C.H. Flather, and K.H. Pollock. 1998. Higher temporal variability of forest breeding bird communities in fragmented landscapes. Proceedings of the National Academy of Science. 95: 7497-7501.

Boulinier, T., J.D. Nichols, J.E. Hines, J.R. Sauer, C.H. Flather, and K.H. Pollock. 2001. Forest fragmentation and bird community dynamics: inference at regional scales. Ecology 82:1159-1169.

Brown, S., C. Hickey, B. Harrington, and R. Gill (editors). 2001. United States Shorebird Conservation Plan, 2nd edition. Manomet Center for Conservation Sciences, Manomet, Massachusetts, USA.

Coordinated Bird Monitoring Working Group. 2004. Monitoring avian conservation: Rationale, design, and coordination. Unpublished report, Bird Conservation Committee, International Association of Fish and Wildlife Agencies, Washington, D.C. 28 pp.

Dahl, T. E. 1990. Wetlands losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Dahl, T. E. 2000. Status and trends of wetlands in the conterminous United States 1986-1997. U. S. Fish and Wildlife Service, Washington, D.C.

Donovan, T.M., and C.H. Flather. 2002. Relationships among North American songbird trends, habitat fragmentation, and landscape occupancy. Ecological Applications 12:364-374.

Droege, S., and J.R. Sauer. 1994. Are more North American species decreasing than increasing? Pages 297-306 *in* E.J.M. Hagemeiyer and T.J. Verstrael, eds. Bird Numbers 1992: Distribution, monitoring and ecological aspects. Statistics Netherlands, VoorburgHaarlem.

Freemark, K.E. and D.A. Kirk. 2001. Birds on organic and conventional farms in Ontario: partitioning effects of habitat and practices on species composition. Biological Conservation 101:337-350.

Hagan, J.M., III. 1993. Decline of the Rufous-sided Towhee in the eastern United States. Auk 110: 863-874.

Herkert, J.R. 1998. The influence of the CRP on grasshopper sparrow population trends in the mid-continental United States. Wildlife Society Bulletin 26:227-231.

Holmes, R.T., and T.W. Sherry. 1988. Assessing population trends of New Hampshire forest birds: local vs. regional patterns. Auk 105:756-768.

Holmes, R.T. and T.W. Sherry. 2001. Thirty-year bird population trends in an unfragmented temperate deciduous forest: importance of habitat change. Auk 118:589-609.

Hutto, R. L., and J. S. Young. 2002. Regional landbird monitoring: perspectives from the northern Rocky Mountains. Wildlife Society Bulletin 30:738-750

Jobin, B., J.-L. DesGranges, and C. Boutin. 1996. Population trends in selected species of farmland birds in relation to recent developments in agriculture in the St. Lawrence valley. Agriculture, Ecosystems, and Environment 57:103-116.

Jones, K.B., A.C. Neale, M.S. Nash, K.H. Riitters, J.D. Wickham, R.V. O'Neill, V. Remortel. 2000. Landscape correlates of breeding bird richness across the United States mid-Atlantic region. Environmental Monitoring and Assessment 63:159-174.

Keitt, T.H., and H.E. Stanley. 1998. Dynamics of North American breeding bird populations. Nature 393: 257-260.

Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M.A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, D.C., U.S.A.

Mehlman, D.W. 1997. Change in avian abundance across the geographic range in response to environmental change. Ecological Applications 7:614-624.

Nicholls, R.J. 2004. Coastal flooding and wetland loss in the 21st century: changes under the SRES climate and socio-economic scenarios. Global Environmental change 14:69-86.

Peterson, A.T. 2001. Predicting species' geographic distributions based on ecological niche modeling. Condor 103:599-605.

Reynolds, R.E., T. L. Shaffer, J.R. Sauer, and B.G. Peterjohn. 1994. Conservation Reserve Program: benefit for grassland birds in the Northern Plains. Transactions of the 59th North American Wildlife & Natural Resources Conference:328-336.

Ribic, C.A., S. Lewis, S. Melvin, J. Bart and B. Peterjohn. 1999. Proceedings of the marsh bird monitoring workshop. USFWS Region 3 Administrative Report, Fort Snelling, Minnesota.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Punjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, and T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Laboratory of Ornithology, Ithaca, N.Y.

Robbins, C.S. 1979. Effect of forest fragmentation on bird populations. Pages 198-212 *in* R.M. DeGraaf and K.E. Evans, eds. Proceedings of the workshop on management of northcentral and northeastern forests for nongame birds. USFS General Technical Report NC-51. Minneapolis, MN.

Robbins, C.S. 1980. Effect of forest fragmentation on breeding bird populations in the Piedmont of the mid-Atlantic region. Atlantic Naturalist 33:31-36.

Sauer, J.R., G.W. Pendleton, and B.G. Peterjohn. 1996. Evaluating causes of population change in North American insectivorous birds. Conservation Biology 10:465-478.

Schmidt, P. 2006. 2006. U.S. NABCI committee takes a lead on monitoring. The All-bird bulletin, January 2006. North American Bird Conservation Initiative, U. S. Fish and Wildlife Service, Washington, DC

Taper, M.L., K. Böhning-Gaese, and J.H. Brown. 1995. Individualistic responses of bird species to environmental change. Oecologia 101:478-486.

U. S. Fish and Wildlife Service. 2002. Birds of conservation concern 2002. Division of Migratory bird Management, Arlington, VA.

Viet, R.R., and M.A. Lewis. 1996. Dispersal, population growth, and the Allee effect: dynamics of the House Finch invasion of eastern North America. American Naturalist 148: 255-274.

Wootton, J.T. 1987. Interspecific competition between introduced House Finch populations and two associated passerine species. Oecologia 71:325-331.